Knowledge, learning, and teaching: Studies on the application of constructivist principles in higher education

Summary

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Knowledge, learning, and teaching are the main issues that are investigated in the present thesis. What is knowledge, how do students know what they know, how do students learn, which are the characteristics of learning environments and tasks for constructive learning? Theories and ideas about knowledge and learning in higher education have been influenced by constructivist views on what knowledge is, and how students gain knowledge and understanding through dialogue and collaboration. When knowledge is a human construction that does not represent an objective reality and cannot be absolutely true, but only viable, the question arises how learners are able to construct shared understandings and come to agreement on which knowledge really counts. The present thesis researches the consequences of constructivist views on higher education for the design of learning environments, and students' perceptions on the level of constructivism and its impact on learning.

Several questions emerge when researching how students perceive characteristics of knowledge and its implications for teaching and learning. For example, the question can be raised about what students think about how objective knowledge is, and how certain they are that teachers teach the 'right' knowledge. Why should students believe in the expertise of teachers and in their authority when constructivist views claim that knowledge is not a true representation of the world outside, but just a viable human construction? Research on the beliefs that students hold about the nature of knowledge and knowing may provide insight into what they believe knowledge is and how it is acquired.

One of the central issues in the present study was the potential impact of students' epistemological beliefs on their conceptions of teaching and learning. Students get involved in learning environments, which confront them with real-life tasks that challenge their thinking and engage them in purposeful learning activities. We tried to develop enhanced understanding of what kind of learning environments fit best in a constructivist framework, and stimulate active and constructive learning in collaboration with other students. Problem-based learning is considered to be prototypical for constructivist learning environments. Problem-based learning confronts students with authentic learning tasks that reflect the complexity of the future work situation. Students learn best when they participate in activities that they perceive as useful and relevant. Real-life tasks are considered as essential elements for stimulating learning activities. The type of task largely determines if, how, and what students are learning.

In the present thesis, research on the relations between knowledge, learning, and teaching was conducted based on two perspectives. The first line of research (chapter 2

and 3) focused on the beliefs about knowledge and knowing that students hold and their conceptions of teaching and learning. Students' epistemological beliefs and their conceptions of teaching and learning served as a frame of reference from which students interpret the demands of the learning environment. What are the epistemological beliefs and conceptions of teaching and learning that students hold? Do students endorse constructivist views about teaching and learning or do they still hold on to traditional ideas about teaching and learning? The second line of research dealt with educational practice and constructivist learning environments. Chapter 4 and 5 described research on constructivist pedagogy in four different learning environments and the characteristics of tasks as challenges for learning.

Chapter 1: The structural relationship between students' epistemological beliefs and conceptions of teaching and learning.

How students construct knowledge, how students know what they know, and what kind of beliefs students hold about knowledge and knowing have become major issues for higher education. The epistemological beliefs that students hold about the nature of knowledge and knowing, are important for influencing their learning activities. Epistemological beliefs are conceptualized as a system of multidimensional beliefs that are more or less independent from one another and may develop asynchronously. The multidimensional conception of epistemological beliefs includes both beliefs about knowledge and beliefs about learning. Previous research on epistemological beliefs confirmed the multidimensionality of epistemological beliefs. In the present study, a 30-item *Epistemological Beliefs Questionnaire (EBQ)* that distinguishes four dimensions of epistemological beliefs was used.

1. The innate/fixed ability dimension assesses the belief in knowledge as inborn and fixed as compared to the belief that knowledge is not inborn and changeable.
2. The learning effort/process dimension refers to the belief in learning by drill and practice at one end or learning as a process of understanding and learning how to learn at the other.
3. The authority/expert knowledge dimension evaluates whether knowledge is being handed down by experts or whether knowledge is created through personal experience and justification.
4. The certainty of knowledge dimension reflects the belief that knowledge is unchangeable and certain at one end or whether knowledge is considered changeable and uncertain at the other.

The present study aimed at establishing structural relationships between students' epistemological beliefs and conceptions of teaching and learning. The participants in the study were 617 students from nine different bachelor programs that have a

problem-based approach to the curriculum as a common characteristic. Students filled out a questionnaire that consisted of three sections: a section that supplied demographic data, a section on epistemological beliefs, the *Epistemological Beliefs Questionnaire (EBQ),* and a section on conceptions of teaching and learning, the *Teaching and Learning Conceptions Questionnaire (TLCQ)*. Results showed that structural relationships could be established between three dimensions of students' epistemological beliefs, and the traditional and constructivist conception of teaching and learning. Satisfactory goodness of fit indices indicated a well-fitting model showing a strong positive relationship from the authority/expert knowledge dimension to the traditional conception of teaching, a negative relationship from the authority/expert dimension to the constructivist conception, a positive relationship from certainty of knowledge to the traditional conception of teaching and learning, a positive relationship from the learning process/effort dimension to the constructivist conception of teaching and learning, and a negative relationship from the learning effort/process dimension to the traditional conception of teaching and learning. No significant relations could be established between the dimension innate/fixed ability and conceptions of teaching and learning.

The present study provides evidence for the multidimensionality of epistemological beliefs and supports the characterization of personal epistemology as a system of more or less independent dimensions. A clear distinction could be made between the traditional and constructivist conception of teaching and learning, and our results show that the majority of the students hold a constructivist conception of teaching and learning, which is in line with a problem-based approach to the curriculum. Though not all students in a problem-based learning environment subscribe to constructivist principles of teaching and learning, the structural relationships between epistemological beliefs and conceptions of teaching and learning show a consistent pattern. The significant relationships from the dimensions of epistemological beliefs to the traditional and constructivist conception of teaching and learning that we found in our structural model, are in agreement with the principles of constructivism and represent an important step in understanding the relations between knowledge, learning, and teaching.

Chapter 3: International hospitality management students' epistemological beliefs and conceptions of teaching and learning.

The provision of high contact services to a wide variety of international guests in the highly globalized hospitality industry can only be successful if hospitality managers and employees are service-driven, empowered, committed, and last but not least well-educated. The question can be raised how to design hospitality management

education that meets the demands from the industry? How can students gain understanding of the globalized hospitality industy in a school setting? Graduates from international hospitality management schools should not only have acquired a comprehensive body of knowledge and skills but must also be competent in leadership, team work, collaboration, intercultural sensitivity, ethical decision making, and problem solving. It is said that the practice of hospitality management calls for a perspective that regards learning as a personal and social knowledge construction process that is integrated in and inseparable from cultural practice. In this way, it opposes the view that knowledge is independent of its social context, can be codified, and can be transmitted through education which takes place outside practice. Some have claimed that constructivist learning designs may meet those demands but the question is whether these learning environments are in alignment with students' epistemological beliefs, and conceptions of teaching and learning.

Our research shows that many students have relatively sophisticated epistemological beliefs. Next, their conceptions of teaching and learning are in line with constructivist educational principles. When looking into more detail, our findings showed that international hospitality management students generally tend not to believe in the authority and expertise of the teacher, and there are indications that they tend to believe that knowledge is certain. International hospitality management students believe that investing time and energy in learning might lead to study success, which is in line with the relatively high mean scores on the constructivist conception of teaching and learning, and the low mean scores on the traditional conception of teaching and learning. Analysis of the findings in the present study brings two issues to the fore. First, it has often been argued that problem-based learning does not fit the cultural and educational background of non-Western students, because these students have been educated in a teaching-learning culture that focuses on passive learning and memorization. The present study shows that international hospitality management students from different cultural and educational backgrounds have conceptions of teaching and learning that enable them to positively experience problem-based learning. Hence, we can conclude that problem-based learning can be used effectively with students from different cultural backgrounds. Second, the issue of the domain specificity or domain generality of epistemological beliefs has often been debated. When we compare the model of structural relations from epistemological beliefs to conceptions of teaching and learning of higher education students with international hospitality management students, we may conclude that de model was not influenced by the domain specific nature of the sample of international hospitality management students. Studying in higher education requires considerable effort and skills. It seems unlikely that cultural factors rather than educational factors explain differences in students' beliefs of knowledge, and conceptions of teaching and learning.

Chapter 4: The identification of constructivist pedagogy in different learning environments.

Learning environments that fit in a constructivist framework are problem-based learning, action learning, project work, and workplace learning. Chapter 4 describes research about the question: Can we find evidence for constructivist pedagogy in four different learning environments?

Results of the present study showed that the just below midpoint score of the students on a five-point scale cannot be considered as strong evidence for the existence of constructivist pedagogy and leaves ample room for improvement. Compared to the other three conditions, students assigned the highest overall mean score to the problem-based learning condition. Problem-based learning takes tasks from the workfield as a starting point for a structured learning process and offers students opportunities for self-directed and collaborative learning. A significant difference could be noticed between the problem-based learning and workplace learning condition. The structures and procedures at the workplace seem to limit the students' opportunities for self-management and self-directed learning, and consequently lower the degree of perceived constructivism. The mere activities that students have to carry out at the workplace, are no guarantee for learning to take place, because work comes first and formost, and learning is more or less a by-product.

No significant differences between the four conditions could be established for instructional designers. Instructional designers positively assessed the application of constructivist principles with an overall mean score above the midpoint of the scale. Compared with students, instructional designers rated problem-based learning as significantly more conforming to constructivism. Though instructional designers positively assessed the application of constructivist principles, even their mean scores leave room for improvement. It could well be the case that the theoretical framework of constructivism has not yet filtered through to the practice of educational designers. So, there is still a lot of work to do in convincing instructional designers of the benefits of constructivist pedagogy and problem-based learning.

Chapter 5: Critical task characteristics in problem-based learning.

One of the instructional design issues in problem-based learning is whether critical task characteristics can be identified that play a key role in student learning. The majority of the principles for designing tasks in problem-based learning seems to be experience-based rather than evidence-based, and consists of practical guidelines with little reference to empirical studies. Though the importance of the PBL-task has been

widely acknowledged, a lack of empirical findings and guidelines for the construction and evaluation of PBL-tasks can be noticed.

Our literature study revealed nine different characteristics that might contribute to the analysis of the characteristics of PBL-tasks: prior knowledge, structuredness, presentation, complexity, domain specificity, internal coherence, personal relevance, cooperation, and professional relevance. The main goal of this study was to develop a checklist for the construction and evaluation of PBL-tasks. A checklist with critical characteristics of PBL-tasks would serve two purposes. First, it might support instructional designers in constructing appropriate PBL-tasks. Second, it provides a tool for the evaluation of PBL-tasks. Data for the present study have been gathered in a sample of undergraduate students and instructors of a hospitality management programme. Students and instructors filled out a questionnaire with 94 importance and performance statements covering nine characteristics of PBL-tasks.

Results showed that an instrument with 44 items and six factors seems to cover the key characteristics of PBL-tasks. Three hypothesized factors did not satisfy the criteria: complexity, domain specificity, and presentation. The factor complexity that is generally considered as theoretical relevant and characteristic for PBL-tasks, did not emerge in our research and lacks empirical support. Analysis of the data also showed no empirical support for the factors domain specificity and problem representation. The factors professional relevance, prior knowledge, cooperation, personal relevance, and internal coherence found empirical confirmation. However, significant differences were found between performance and importance ratings indicating that the performance ratings on several factors was significantly lower than the importance ratings, which leaves room for improvement. Further research is needed to cross-validate the questionnaire and to reduce the length of the questionnaire to serve as a checklist for the construction and evaluation of tasks in problem-based learning.

Conclusions

In the present thesis, two lines of empirical research were applied to examine the interplay between constructivist views on teaching and student learning. The first line of research concerned students' epistemological beliefs and conceptions of teaching and learning that serve as a frame of reference from which students interpret the demands of the learning situation. Our research has shown that the majority of the students in our studies have epistemological beliefs and conceptions of teaching and learning that correspond with core ideas about problem-based learning. The relationships from the dimensions of epistemological beliefs to the traditional and constructivist conceptions of teaching and learning that we established in our structural

model, are in line with constructivist ideas of education and contribute to understanding of the relations between knowledge, learning, and teaching.

The second line of research emerged from the criticism of constructivism on the transmissibility of knowledge and underlined the urge for developing innovative learning environments. Our studies showed that students perceived problem-based learning as more complying to constructivist principles than other learning environments. The task is an essential factor that drives student learning activities in problem-based learning and our research on characteristics of tasks has demonstrated the relevance of a variety of task characteristics in a problem-based learning approach to the curriculum.